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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,523	10/19/2001	Hong-Da Liu	64,600-079	6871

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EXAMINER

NGUYEN, HOAN C

ART UNIT PAPER NUMBER

2871

DATE MAILED: 07/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/032,523

Applicant(s)

LIU ET AL.

Examiner

HOAN C. NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

1. Claims 1, 10, 12 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Saito et al. (US6304308B1).

Saito et al. teach (Figs. 1 and 10A-C) a liquid crystal on silicon structure incorporating integrated spacers and silicon light valves comprising:

- a silicon substrate SUB1 having
 - a first multiplicity of pixel electrodes AL-P formed on a top surface;

- a second multiplicity of integrated spacers SPC-P formed of an insulating material on said top surface of the silicon substrate in-between said first multiplicity of pixel electrodes;
- a third multiplicity of silicon light valves formed on said top surface of the silicon substrate for orienting liquid crystal molecules;
- a glass substrate SUB2 that is optically transparent having an optically transparent electrode layer coated on a bottom surface positioned juxtaposed to and over said silicon substrate supported by said second multiplicity of integrated spacers forming a sealed cavity by engaging a perimeter seal surrounding said two substrates, said sealed cavity encases said optically transparent electrode layer and said third multiplicity of silicon light valves therein; and a liquid crystal material filling said sealed cavity.

wherein

- each of said third multiplicity of silicon light valves being formed of a polysilicon tip and a dielectric material base (claim 10).
- each of said second multiplicity of integrated spacers having a height between about 0.5 μ m and about 10 μ m (claim 12) since the liquid crystal cell gap is about 4-7 μ m (col. 2 lines 10-12).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2-3 and 15 -16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Lu et al. (US6426786B1).

Lu et al. teach (Figs. 5A-B) a liquid crystal comprising a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 2 and 15) and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 2 and 15) and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

3. Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Kim et al. (US6525794B1).

Kim et al. teach (Figs. 3D and 4A-14B) a liquid crystal comprising a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Iwaki et al. (US5646432)

Iwaki et al. teach a liquid crystal with each of said liquid crystal cell having a square configuration with a dimension of each side about $20\mu\text{m}$, that is in a range between about $5\mu\text{m}$ and about $20\mu\text{m}$ for high speed (col. 15 lines 24-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a

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dimension of each side about $20\mu\text{m}$, that is in a range between about $5\mu\text{m}$ and about $20\mu\text{m}$ for high speed

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Bischel et al. (US5544268A)

Bischel et al. teach (col. 111 lines 52-57) a display panel with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than $100\mu\text{m}$ that covers in a range between about $0.3\mu\text{m}$ and about $2\mu\text{m}$ for high resolution.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than $100\mu\text{m}$ that covers in a range between about $0.3\mu\text{m}$ and about $2\mu\text{m}$ for high resolution.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Rosenblatt et al. (US5477358A)

Rosenblatt et al. teach (col. 2 lines 4-10) a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of

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the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

7. Claims 8 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of AKIMOTO et al. (JP361215522)

AKIMOTO et al. teach spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

8. Claims 9, 11 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14.

Saito et al. also disclose the top surface of the silicon substrate being covered by a layer of metallic reflective film (col.6 lines 33-34) for reflecting light.

However, Saito et al. fail to disclose said reflective metal layer formed by a metal selected from the group consisting of Al, Ag and Al--Nd.

It is well known in the art that the reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with the top surface of the silicon substrate being covered by a layer of metallic reflective film for reflecting light and this reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) as applied to claims 1, 10, 12 and 14 in view of Nishio et al. (US6046547A).

Nishio et al. teach a liquid crystal display with each of said third multiplicity of silicon light valves having a height between about 0.3 μ m and about 3 μ m for eliminating irregularities caused by the TFT and treatment of flattening (col. 5 lines 56-61).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said third multiplicity of silicon light valves having a height between about 0.3 μ m and about 3 μ m for eliminating irregularities caused by the TFT and treatment of flattening.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Li et al. (US5831700A) disclose the domain liquid crystal displays fabricated using the fringe field effect and homeotropic alignment layers.

Kim et al. (US6512503B1) disclose liquid crystal display comprising homeotropic alignment layers at inner surfaces of the upper and the lower substrates respectively.

Bos et al. (US6141074A) disclose the four domain liquid crystal displays fabricated using the fringe field effect and homeotropic alignment layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOAN C. NGUYEN whose telephone number is (703) 306-0472. The examiner can normally be reached on MONDAY-THURSDAY:8:00AM-4:30PM.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

HOAN C. NGUYEN
Examiner
Art Unit 2871

chn
July 11, 2003


TOANTON
PRIMARY EXAMINER